PATENT ABSTRACTS OF JAPAN

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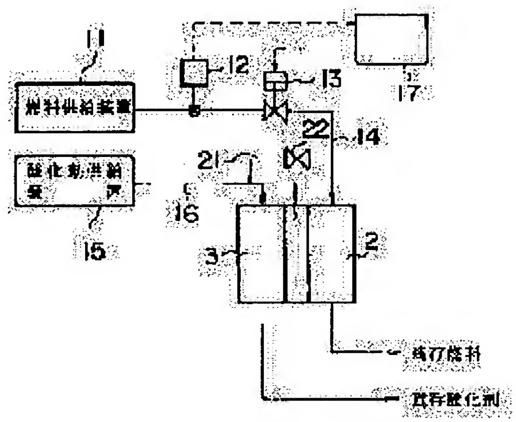
(54) SOLID POLYMER ELECTROLYTIC FUEL CELL SYSTEM

(57)Abstract:

PURPOSE: To provide a solid polymer electrolytic fuel cell system having a renewable fuel cell body contaminated by CO.

CONSTITUTION: A solid polymer electrolytic fuel cell system has an electrode jointed bodyformed by jointing an anode (2) and a cathode (3) on both faces of a solid polymer electrolyte (1) respectively. Power generation is achieved by supplying fuel to the anode side and oxidizer to the cathode side of the electrode jointed body respectively. A by-pass line (21) having a gate valve (22) leading from an oxidizer supplying line (16) to a fuel supplying line (14) is provided. If the anode (2) is contaminated by CO, the anode (2) is regenerated by supplying the oxidizer thereto through the by-pass line (21).



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CLAIMS

[Claim(s)]
[Claim 1] The solid-state polyelectrolyte fuel cell system characterized by preparing the bypass line equipped with the sluice valve which leads to a fuel-supply line from an oxidizer supply line in the solid-state polyelectrolyte fuel cell system which has the electrode zygote which joined the anode and the cathode to both sides of a solid-state polyelectrolyte, respectively, and generates electricity by supplying a fuel to the anode side of an electrode zygote, and supplying an oxidizer to a cathode side, respectively.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] Especially this invention relates to the system which can reproduce the anode which carried out poisoning to the carbon monoxide about a solid-state polyelectrolyte fuel cell system.
[0002]
[Description of the Prior Art] The principle of a solid-state polyelectrolyte fuel cell is explained with reference to drawing 3 . In drawing 3 , the anode 2 and cathode 3 which consist of a platinum catalyst, for example, respectively are formed in both sides of the electrolyte 1 which consists of fluororesin system ion exchange membrane with macromolecule ion exchange membrane, for example, a sulfonic group, the porosity carbon electrodes 4 and 5 are further formed in these both sides, and the electrode zygote 6 is constituted. The porosity carbon electrodes 4 and 5 are connected to the external circuit 7.
[0003] The gas which contains hydrogen in an anode 2 as a fuel is humidified and supplied, and oxygen is humidified and supplied to a cathode 3 as an oxidizer. The hydrogen supplied to the anode 2 is hydrogen-ion-ized on an anode. A hydrogen ion moves the inside of an electrolyte 1 to a cathode 3 side as H^+ and xH_2O at the basis of inclusion of water, and an electron moves to a cathode 3 side through an external circuit 7. On a cathode 3, the hydrogen ion which moved reacts with the electron which passed through the oxygen and the external circuit in an oxidizer, and generates water. The generated water is discharged out of a fuel cell from a cathode 3 side. At this time, the electron flow which passes through an external circuit 7 can be used as electrical energy of a direct current. These reactions are summarized as follows.
Anode $H_2 \rightarrow 2H^+ + 2e^-$ cathode $1/2O_2 + 2H^+ + 2e^- \rightarrow H_2O$ overall reaction $H_2 + 1/2O_2 \rightarrow H_2O$ [0004] If the amount of adsorption of platinum which constitutes the anode of a fuel cell of CO increases when the fuel containing CO is supplied, the function as a catalyst will be lost and a cell reaction will no longer be performed. The relation between the threshold limit value of the carbon monoxide in a fuel and operation operating temperature is shown in drawing 4 . This fuel cell is usually operated at the low temperature around about 120 degrees C from ordinary temperature. Therefore, it is necessary to hold down the carbon monoxide (CO) concentration contained in a fuel to about 10 ppm or less.
[0005] When CO concentration in the fuel supplied to a fuel cell exceeds an allowed value, he intercepts supply of a fuel and is trying to prevent CO poisoning of an anode beforehand in the conventional solid electrolyte fuel cell system. With reference to drawing 2 , such a conventional solid electrolyte fuel cell system is explained. In drawing 2 , the anode 2 and the cathode 3 are formed in both sides of an electrolyte 1, respectively. A fuel is supplied to an anode 2 through the fuel-supply line 14 in which the carbon monoxide detector 12 and the isolation valve 13 were attached from a fuel supply system 11. An oxidizer is supplied to a cathode 3 through the oxidizer supply line 16 from the oxidizer feeder 15. And when the carbon monoxide more than an allowed value is detected by the carbon monoxide detector 12, according to the detecting signal, an isolation valve 13 is intercepted with a control unit 17.
[0006]
[Problem(s) to be Solved by the Invention] Although a means to intercept fuel supply was established in

the conventional solid-state polyelectrolyte fuel cell system shown in drawing 2 , a means to reproduce a cell was not taken into consideration. For this reason, advanced dependability was required of the carbon monoxide detector 12, the isolation valve 13, and the control unit 17, and it had led to the cost rise of the whole system. Moreover, the body of a fuel cell which carried out CO poisoning needed to be removed and exchanged from the system. The object of this invention is to offer the solid-state polyelectrolyte fuel cell system which can reproduce the body of a fuel which carried out CO poisoning.

[0007]

[Means for Solving the Problem] The solid-state polyelectrolyte fuel cell system of this invention is characterized by preparing the bypass line equipped with the sluice valve which leads to a fuel-supply line from an oxidizer supply line in the solid-state polyelectrolyte fuel cell system which has the electrode zygote which joined the anode and the cathode to both sides of a solid-state polyelectrolyte, respectively, and generates electricity by supplying a fuel to the anode side of an electrode zygote, and supplying an oxidizer to a cathode side, respectively.

[0008]

[Function] In the solid-state polyelectrolyte fuel cell system of this invention, when an anode carries out CO poisoning, oxidation clearance of CO by which the anode was adsorbed can be carried out by letting the bypass line and fuel-supply line which were equipped with the sluice valve from the oxidizing agent supply line pass, and supplying an oxidizing agent to an anode. Consequently, without removing a cell proper from a system, the original catalytic activity of the platinum which constitutes an anode can be regained, and it can reproduce. Moreover, since an anode is reproducible in this way, the dependability of a carbon monoxide detector, an isolation valve, and a control unit does not need to be so high, and system-wide cost can be reduced.

[0009]

[Example] Hereafter, the example of this invention is explained with reference to a drawing.

[0010] Drawing 1 is the block diagram showing the solid-state polyelectrolyte fuel cell stack of this invention. In drawing 1 , the anode 2 and the cathode 3 are formed in both sides of an electrolyte 1, respectively.

[0011] A fuel is supplied to an anode 2 through the fuel-supply line 14 in which the carbon monoxide detector 12 and the isolation valve 13 were attached from a fuel supply system 11. An oxidizer is supplied to a cathode 3 through the oxidizer supply line 16 from the oxidizer feeder 15. And when the carbon monoxide more than an allowed value is detected by the carbon monoxide detector 12, according to the detecting signal, an isolation valve 13 is intercepted with a control unit 17. Moreover, between the oxidizing agent supply line 16 and the fuel-supply line 14, the bypass line 21 equipped with the sluice valve 22 is formed.

[0012] In this solid-state polyelectrolyte fuel cell system, when the engine performance falls by CO poisoning of an anode 2, oxidation clearance of CO by which the anode was adsorbed can be carried out by opening a sluice valve 22, letting a bypass line 21 and the fuel-supply line 14 pass from the oxidizing agent supply line 16, and supplying an oxidizing agent to an anode 2. Consequently, without removing a cell proper from a system, the original catalytic activity of the platinum which constitutes an anode 2 can be regained, and it can reproduce, and excels in maintenance nature. Moreover, since an anode 2 is reproducible in this way, the dependability of the carbon monoxide detector 12, an isolation valve 13, and a control unit 17 does not need to be so high, and system-wide cost can be reduced.

[0013]

[Effect of the Invention] As explained in full detail above, according to this invention, the solid-state polyelectrolyte fuel cell system which can reproduce easily the body of a fuel cell which carried out CO poisoning can be offered.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] Especially this invention relates to the system which can reproduce the anode which carried out poisoning to the carbon monoxide about a solid-state polyelectrolyte fuel cell system.

[Translation done.]

* NOTICES *

PRIOR ART

[Description of the Prior Art] The principle of a solid-state polyelectrolyte fuel cell is explained with reference to drawing 3 . In drawing 3 , the anode 2 and cathode 3 which consist of a platinum catalyst, for example, respectively are formed in both sides of the electrolyte 1 which consists of fluororesin system ion exchange membrane with macromolecule ion exchange membrane, for example, a sulfonic group, the porosity carbon electrodes 4 and 5 are further formed in these both sides, and the electrode zygote 6 is constituted. The porosity carbon electrodes 4 and 5 are connected to the external circuit 7.
[0003] The gas which contains hydrogen in an anode 2 as a fuel is humidified and supplied, and oxygen is humidified and supplied to a cathode 3 as an oxidizer. The hydrogen supplied to the anode 2 is hydrogen-ion-ized on an anode. A hydrogen ion moves the inside of an electrolyte 1 to a cathode 3 side as H^+ and xH_2O at the basis of inclusion of water, and an electron moves to a cathode 3 side through an external circuit 7. On a cathode 3, the hydrogen ion which moved reacts with the electron which passed through the oxygen and the external circuit in an oxidizer, and generates water. The generated water is discharged out of a fuel cell from a cathode 3 side. At this time, the electron flow which passes through an external circuit 7 can be used as electrical energy of a direct current. These reactions are summarized as follows.
Anode $H_2 \rightarrow 2H^+ + 2e^-$ cathode $1/2O_2 + 2H^+ + 2e^- \rightarrow H_2O$ overall reaction $H_2 + 1/2O_2 \rightarrow H_2O$ [0004] If the amount of adsorption of platinum which constitutes the anode of a fuel cell of CO increases when the fuel containing CO is supplied, the function as a catalyst will be lost and a cell reaction will no longer be performed. The relation between the threshold limit value of the carbon monoxide in a fuel and operation operating temperature is shown in drawing 4 . This fuel cell is usually operated at the low temperature around about 120 degrees C from ordinary temperature. Therefore, it is necessary to hold down the carbon monoxide (CO) concentration contained in a fuel to about 10 ppm or less.
[0005] When CO concentration in the fuel supplied to a fuel cell exceeds an allowed value, he intercepts supply of a fuel and is trying to prevent CO poisoning of an anode beforehand in the conventional solid electrolyte fuel cell system. With reference to drawing 2 , such a conventional solid electrolyte fuel cell system is explained. In drawing 2 , the anode 2 and the cathode 3 are formed in both sides of an electrolyte 1, respectively. A fuel is supplied to an anode 2 through the fuel-supply line 14 in which the carbon monoxide detector 12 and the isolation valve 13 were attached from a fuel supply system 11. An oxidizer is supplied to a cathode 3 through the oxidizer supply line 16 from the oxidizer feeder 15. And when the carbon monoxide more than an allowed value is detected by the carbon monoxide detector 12, according to the detecting signal, an isolation valve 13 is intercepted with a control unit 17.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained in full detail above, according to this invention, the solid-state polyelectrolyte fuel cell system which can reproduce easily the body of a fuel cell which carried out CO poisoning can be offered.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Although a means to intercept fuel supply was established in the conventional solid-state polyelectrolyte fuel cell system shown in drawing 2 , a means to reproduce a cell was not taken into consideration. For this reason, advanced dependability was required of the carbon monoxide detector 12, the isolation valve 13, and the control unit 17, and it had led to the cost rise of the whole system. Moreover, the body of a fuel cell which carried out CO poisoning needed to be removed and exchanged from the system. The object of this invention is to offer the solid-state polyelectrolyte fuel cell system which can reproduce the body of a fuel which carried out CO poisoning.

[Translation done.]

MEANS

[Means for Solving the Problem] The solid-state polyelectrolyte fuel cell system of this invention is characterized by preparing the bypass line equipped with the sluice valve which leads to a fuel-supply line from an oxidizer supply line in the solid-state polyelectrolyte fuel cell system which has the electrode zygote which joined the anode and the cathode to both sides of a solid-state polyelectrolyte, respectively, and generates electricity by supplying a fuel to the anode side of an electrode zygote, and supplying an oxidizer to a cathode side, respectively.

[Translation done.]

OPERATION

[Function] In the solid-state polyelectrolyte fuel cell system of this invention, when an anode carries out CO poisoning, oxidation clearance of CO by which the anode was adsorbed can be carried out by letting the bypass line and fuel-supply line which were equipped with the sluice valve from the oxidizing agent supply line pass, and supplying an oxidizing agent to an anode. Consequently, without removing a cell proper from a system, the original catalytic activity of the platinum which constitutes an anode can be regained, and it can reproduce. Moreover, since an anode is reproducible in this way, the dependability of a carbon monoxide detector, an isolation valve, and a control unit does not need to be so high, and system-wide cost can be reduced.

[Translation done.]

EXAMPLE

[Example] Hereafter, the example of this invention is explained with reference to a drawing.
[0010] Drawing 1 is the block diagram showing the solid-state polyelectrolyte fuel cell stack of this invention. In drawing 1 , the anode 2 and the cathode 3 are formed in both sides of an electrolyte 1, respectively.
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[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Solid-state polyelectrolyte fuel cell structure-of-a-system drawing in the example of this invention.
[Drawing 2] The conventional solid-state polyelectrolyte fuel cell structure-of-a-system drawing.
[Drawing 3] Drawing showing the principle of a solid-state polyelectrolyte fuel cell.
[Drawing 4] Drawing showing the relation between the threshold limit value of the carbon monoxide in a fuel, and operation operating temperature.
[Description of Notations]
1 [-- A porosity carbon electrode, 6 / -- An electrode zygote, 7 / -- An external circuit, 11 / -- A fuel supply system, 12 / -- A carbon monoxide detector, 13 / -- An isolation valve, 14 / -- A fuel-supply line, 15 / -- An oxidizing agent feeder, 16 / -- An oxidizing agent supply line, 17 / -- A control unit, 21 / -- A bypass line, 22 / -- Sluice valve.] -- An electrolyte, 2 -- An anode, 3 -- 4 A cathode, 5

[Translation done.]

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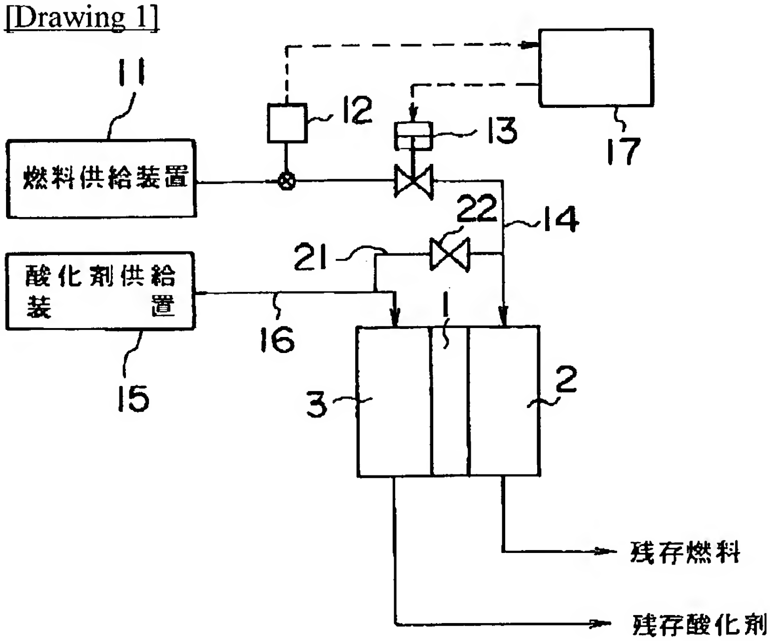
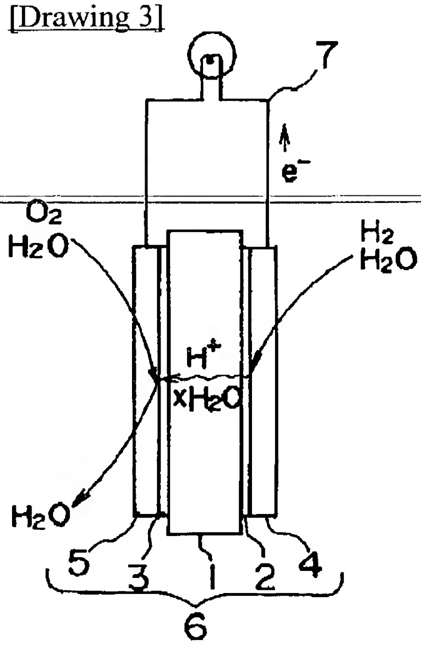
DRAWINGS

[Drawing 1]



[Drawing 3]



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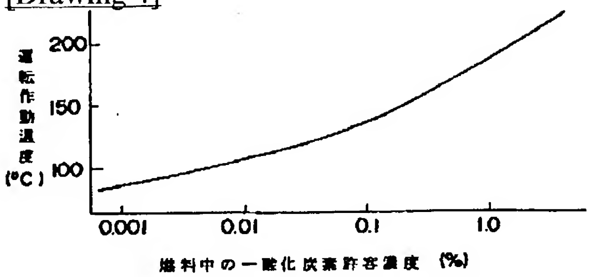
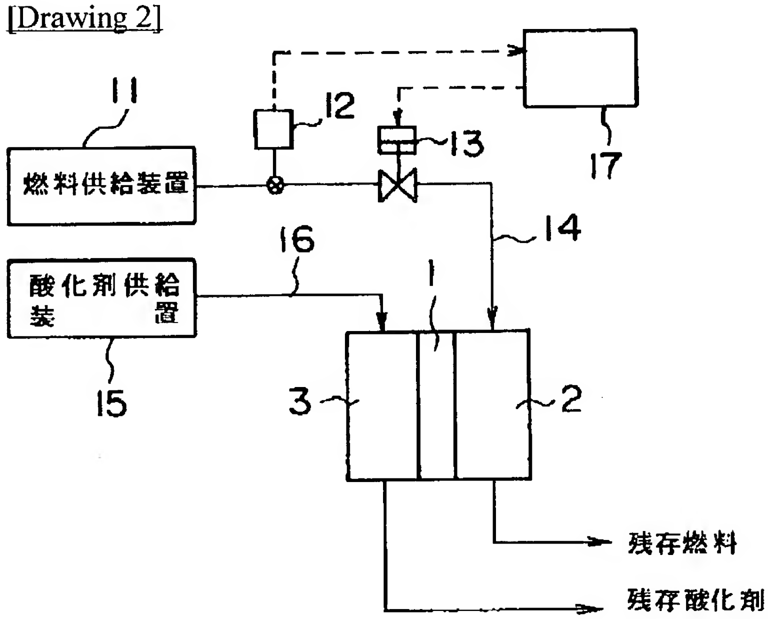
[Drawing 4]



[Drawing 2]



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